WHAT IS CLAIMED IS:

1. A turbocharger, comprising:

a turbine mounted on a rotatable shaft for rotation about an axis of the shaft;

a compressor comprising a compressor wheel mounted on the shaft, the compressor wheel comprising a first-stage impeller and a second-stage impeller, the compressor further comprising an interstage duct that receives pressurized fluid from the first-stage impeller and conducts the fluid to the second-stage impeller, a ring of deswirl vanes located upstream of the second-stage impeller for reducing a swirl component of flow coming out of the interstage duct before said flow enters the second-stage impeller, and a discharge duct that receives pressurized fluid from the second-stage volute and conducts said fluid out of the compressor;

wherein the first- and second-stage impellers are arranged back-to-back, the second-stage volute is disposed generally concentrically within the interstage duct, the discharge duct passes from the second-stage volute through the interstage duct such that the fluid flowing in the interstage duct must flow around the discharge duct before reaching the second-stage impeller, and wherein the ring of deswirl vanes is non-axisymmetric for taking into account non-axisymmetric flow conditions caused by the presence of the discharge duct.

2. The turbocharger of claim 1, wherein the ring of deswirl vanes includes a relatively thick vane that envelops the discharge duct, the thick vane having an outer surface exposed to the fluid flowing through the ring of deswirl vanes and having an internal passage through which the discharge duct passes.

3. The turbocharger of claim 2, wherein the ring of deswirl vanes includes a plurality of additional relatively thinner vanes spaced apart about a circumference of the ring, vanes nearer to the thick vane differing in configuration from vanes that are farther from the thick vane.

4. The turbocharger of claim 3, wherein the additional vanes progressively vary in configuration about the circumference of the ring.

5. The turbocharger of claim 3, wherein the additional vanes and a trailing-edge portion of the thick vane are integrally formed together as a one-piece ring, and wherein the thick vane further includes a leading-edge portion formed separately from the ring and mated with the trailing-edge portion.

6. The turbocharger of claim 5, wherein the internal passage of the thick vane is formed in the leading-edge portion of the thick vane.

7. The turbocharger of claim 6, wherein the leading-edge portion of the thick vane is formed integrally with a housing of the compressor, the housing also forming the interstage duct.

8. The turbocharger of claim 5, wherein the leading-edge portion of the thick vane has a first thickness at a downstream end thereof and the trailing-edge portion of the thick vane has a maximum thickness substantially at an upstream end thereof that substantially matches said first thickness, the upstream end of the trailing-edge portion mating with the downstream end of the leading-edge portion.

9. The turbocharger of claim 1, wherein the compressor further comprises a first-stage diffuser between the first-stage impeller and the interstage duct for diffusing the fluid.

10. The turbocharger of claim 9, further comprising a stationary seal plate separating the first-stage diffuser from the second-stage volute, a rotating seal being arranged between the seal plate and the compressor wheel.

11. A turbocharger, comprising:

a turbine mounted on a rotatable shaft for rotation about an axis of the shaft;

a compressor comprising a first-stage impeller mounted on the shaft, a second-stage impeller mounted on the shaft, an interstage duct that receives pressurized fluid from the first-stage impeller and conducts the fluid to the second-stage impeller, a second-stage volute that receives pressurized fluid from the second-stage impeller, a plurality of circumferentially spaced deswirl vanes located upstream of the second-stage impeller for reducing a swirl component of

flow coming out of the interstage duct before said flow enters the second-stage impeller, and a discharge duct that receives pressurized fluid from the second-stage volute and conducts said fluid out of the compressor;

the first- and second-stage impellers being arranged back-to-back, the second-stage volute disposed generally concentrically within the interstage duct, the discharge duct passing from the second-stage volute through the interstage duct such that the fluid flowing in the interstage duct must flow around the discharge duct before reaching the second-stage impeller; and

the deswirl vanes comprising a relatively thick vane that envelops the discharge duct and guides the fluid around the discharge duct, and a plurality of relatively thinner vanes circumferentially spaced on opposite sides of the thick vane, the vanes continuously varying in configuration about a circumference.

12. The turbocharger of claim 11, wherein the interstage duct is generally annular in configuration and a leading-edge portion of the relatively thick vane occupies the interstage duct and extends between a radially inner wall of the interstage duct and a radially outer wall of the interstage duct.

13. The turbocharger of claim 12, wherein the leading-edge portion of the thick vane defines an inner passage through which the discharge duct passes.

14. The turbocharger of claim 13, wherein a trailing-edge portion of the thick vane is formed separately from the leading-edge portion.

15. The turbocharger of claim 14, wherein the trailing-edge portion is formed along with the relatively thinner vanes as an integral ring.

16. The turbocharger of claim 12, wherein the leading-edge portion of the thick vane is formed integrally with at least one wall of the interstage duct.

17. A combined interstage duct and second-stage volute for a two-stage radial compressor having first-stage and second-stage impellers arranged back-to-back wherein pressurized fluid from the first-stage impeller flows radially outwardly into the interstage duct and flows from the interstage duct radially inwardly into the second-stage impeller and pressurized fluid from the second-stage impeller flows radially outwardly into the second-stage volute, comprising

a structure defining an outer wall and an inner wall spaced radially inward of the outer wall so as to define the interstage duct between a radially inner surface of the outer wall and a radially outer surface of the inner wall, the inner wall being generally scroll-shaped so as to define the second-stage volute, and a vane integrally formed with at least one of the inner and outer walls and extending between the inner and outer walls in the interstage duct, the vane defining an inner passage therein for passage of a discharge duct from the second-stage volute.

18. A non-axisymmetric deswirl vane ring for a two-stage radial compressor, comprising:

a generally annular disk; and

a plurality of circumferentially spaced deswirl vanes affixed to the disk, the vanes including a relatively thick vane and a plurality of relatively thinner vanes.

19. The non-axisymmetric deswirl vane ring of claim 18, wherein thinner vanes located nearer to the thick vane differ in configuration from thinner vanes located farther from the thick vane.

20. The non-axisymmetric deswirl vane ring of claim 19, wherein the thinner vanes progressively vary in shape about a circumference of the ring.

21. The non-axisymmetric deswirl vane ring of claim 18, wherein the thick vane defines a concave pressure-side surface and a convex suction-side surface, between which a thickness of the thick vane is defined, and wherein a maximum thickness of the thick vane occurs substantially at an upstream end of the thick vane.

22. A two-stage radial compressor, comprising

a compressor wheel mounted on a shaft, the compressor wheel comprising a first-stage impeller and a second-stage impeller, the compressor further comprising an interstage duct that receives pressurized fluid from the first-stage impeller and conducts the fluid to the second-stage impeller, a ring of deswirl vanes located upstream of the second-stage impeller for reducing a swirl component of flow coming out of the interstage duct before said flow enters the second-stage impeller, and a discharge duct that receives pressurized fluid from the second-stage volute and conducts said fluid out of the compressor;

wherein the first- and second-stage impellers are arranged back-to-back, the second-stage volute is disposed generally concentrically within the interstage duct, the discharge duct passes from the second-stage volute through the interstage duct such that the fluid flowing in the interstage duct must flow around the discharge duct before reaching the second-stage impeller, and wherein the ring of deswirl vanes is non-axisymmetric for taking into account non-axisymmetric flow conditions caused by the presence of the discharge duct.

23. The compressor of claim 22, wherein the ring of deswirl vanes includes a relatively thick vane that envelops the discharge duct, the thick vane having an outer surface exposed to the fluid flowing through the ring of deswirl vanes and having an internal passage through which the discharge duct passes.

24. The compressor of claim 23, wherein the ring of deswirl vanes includes a plurality of additional relatively thinner vanes spaced apart about a circumference of the ring, vanes nearer to the thick vane differing in configuration from vanes that are farther from the thick vane.

25. The compressor of claim 24, wherein the additional vanes and a trailing-edge portion of the thick vane are integrally formed together as a one-piece ring, and wherein the thick vane further includes a leading-edge portion formed separately from the ring and mated with the trailing-edge portion.